

**ABSTRACT**

[0052] The present invention concerns a sensor array and related testing apparatus for rapidly detecting the presence and/or concentration of constituents in samples, particularly biological molecules in fluid samples, including associated testing methods. The invention can be adapted such that a plurality of the sensors each detect a different constituent so that the invention can rapidly detect multiple constituents in a single sample. The sensors may be arranged in an array and connected by a plurality of micro channels that are fed from a main channel into which the sample is introduced. Positive pressure can be applied to the main and micro channels by a micro-pump. Alternately, it can be adapted to detect one or more constituents in a plurality of separate samples. A plurality of sensors are provided, each comprising electrochemical cells comprising an anode, a cathode and a reference electrode separated from each other by one or more filters within which an electrolyte is suspended. The cathode of each sensor is particularly adapted to optimize adherence to it of the particular constituent that it is designed to detect. The electrodes of each sensor are electrically coupled to a miniature electrochemical analyzer designed to send electrical pulses (voltage or current) to the electrochemical cell, and measure the response (current or voltage) by the electrochemical cells responsive to the pulses and then analyze the response to determine the presence and/or concentration of the constituents. The transient current or voltage responses are affected by the type and concentration of the constituent that adheres to the cathode of the particular sensor.